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JOURNAL OF ELECTRICITY POWER AND GAS

TELEPHONE NUMBER

Devoted to the Conversion, Transmission and Distribution of Energy

Entered as second-class matter May 7, 1906, at the Post Office at San Francisco, Cal., under the Act of Congress March 3, 1879

VOL. XXII NO. 15 | SAN FRANCISCO, APRIL 10, 1909 | PER COPY, 10 CENTS

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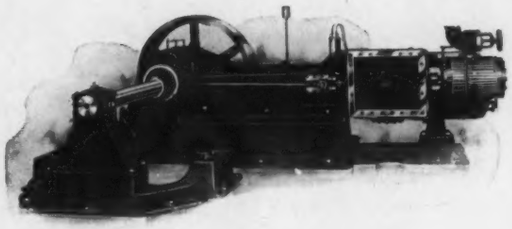

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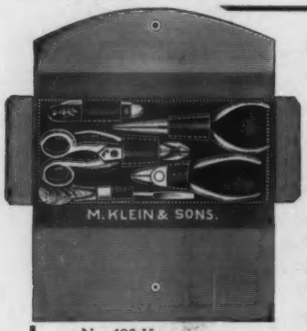

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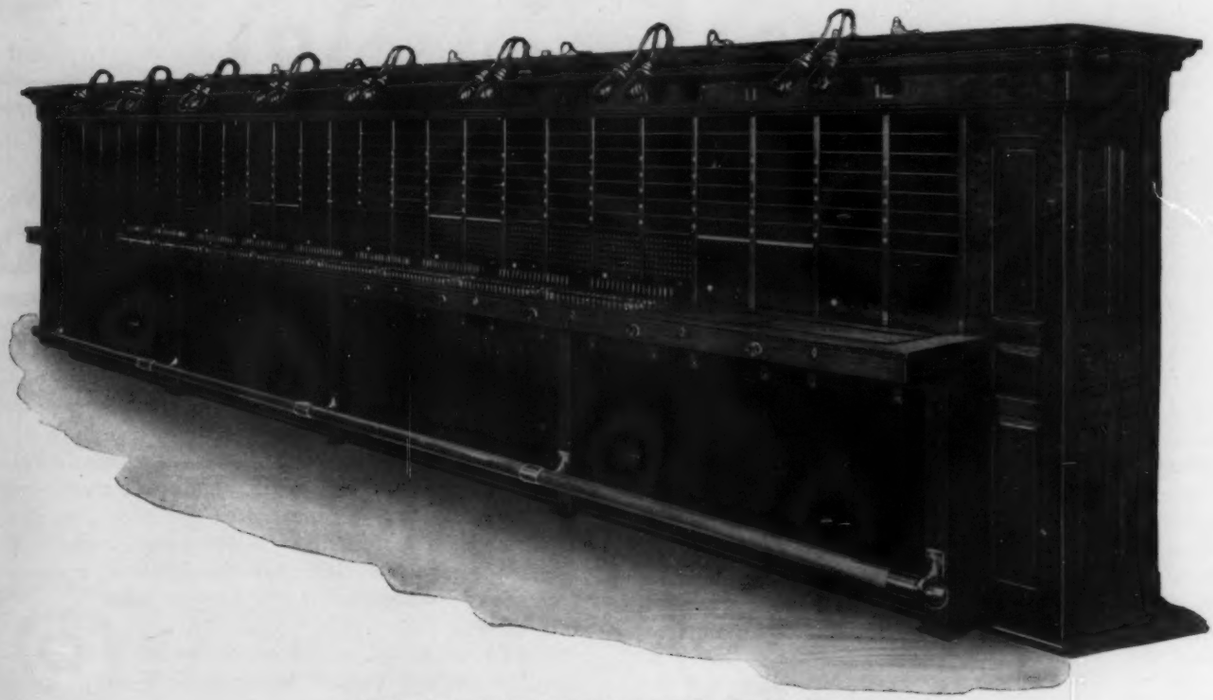
VOLUME XXII. SAN FRANCISCO, APRIL 10, 1909 NUMBER 15

TELEPHONE SWITCHBOARD AT EVERETT, WASHINGTON.

BY GEORGE A. SCOVILLE.

The growth of independent telephony in the Northwest has always been assured through the wisdom of many large operating companies. As compared with cities of small size in the East, most of the purchasers have bought equipment of a remarkable ultimate capacity. Everett, Wash., for instance, is a city of about 25,000 inhabitants. The old Eastern telephone operator, in a city of this size, would purchase no larger than a three-section common battery board, which would be amply sufficient to meet his most sanguine expectations. If such a scheme had been adopted in Everett, the remarkable success and growth of the Farmers' Mutual Independent Telephone Company would have necessitated the early purchase of exchange additions that could not have been installed as reasonably as with the initial job.

In December, 1906, a four-section Dean common-battery multiple switchboard was installed. Complete power and terminal facilities were also provided, as well as ample switching room for toll-calls, and modern wire chief's and chief operator's desks. In fact, the exchange was the most modern obtainable at that time, and the operating company has kept the equipment thoroughly up to date. Provision was made for handling 960 local lines. Since their equipment is designed for operation by means of the Dean harmonic system, this number does not represent the total number of subscribers that might be handled without increasing the exchange facilities. The harmonic party line ringing system has since been developed so that many operators are able to average three subscribers to a circuit. Any telephone investor will appreciate



Telephone Switchboard at Everett, Washington.

how profitable would be any development that would not require a proportionate increase in the exchange investment.

The switchboard proper consists of four sections of six panels each. Each section provides three operators' positions, and the ultimate capacity of the entire board is 3,000 lines. The trunking facilities from the toll board and from the wire chief's and chief operator's desk are looked out for in the second position. From the third to tenth positions, inclusive, each operator handles 120 incoming lines, with ten per strip answering and lamp jacks. Each position is provided with 15 local cord circuits, all of which are equipped with Dean harmonic four-party ringing keys, which are operated without the use of ground or third-wire connections. Breast-plate transmitters are used throughout.

As will be noted from the illustration, the eleventh and twelfth positions were left blank in the original installation. These have been partially filled up by rapid increase in business since the board was cut over. The illustration will further show the method of lighting, which has been very satisfactory. Connections are provided on the rear of the board for power for the lights for the switchboard man and for his soldering iron, etc.

The chief operator's desk provides a monitor's position, which contains a most improved system of supervision. This consists of line supervisory pilot lamps for each operator's position, so arranged that the monitor is informed instantly of the failure of any operator to do her work promptly. This monitor is provided with means of listening on a conversation without the operator's knowledge.

The wire chief's desk provides just as efficient equipment for performing his work. He is able by simply throwing the key to determine the actual technical condition of any line. He has several testing trunks to the main operating board, and it should be noted that when he makes a test on a line or when the monitor listens in on a line that this in no way interferes with any incoming or outgoing calls on that circuit. This wire chief's desk is equipped with the most modern technical testing equipment.

The toll board consists of one section of two positions. Since the original installation it has been found necessary to continually make additions to this department of the exchange. The Everett power plant is one of the most complete telephone installations on the Coast. All power may be generated in the building by a gas engine outfit. Complete storage batteries were installed along with the original equipment, and Dean harmonic converters provide selective party line ringing frequencies in a most satisfactory manner.

Tungsten lamps in Germany are being marketed in 16-candle-power size and can be used in any position. There has been a recent reduction of about 30 per cent in German tungsten lamps, the 16-candle-power lamps for 100 to 130 volt service being listed at 50 cents.

A telegraph line across the Sahara desert is being built to connect Algeria with French colonies to the south near Timbuctoo. Hollow steel poles are being used.

STORAGE BATTERIES IN TELEPHONE SERVICE.[1]

BY GEORGE. R MURPHY.

The use of the storage battery has now reached such proportions that one might truly say that it is used in every branch of the electrical art, and the growth of its manufacture has been exceedingly rapid. In telephony alone, the increase in the number and size of cells installed has been very great, especially in the past ten years. It might be said that the storage battery has made the common battery system possible, and in addition has proven on innumerable occasions, an able and ready friend during times of emergency and trouble. In no field is the watchword, "continuity of service" so vital and important as in telephony, and yet in this service the manufacturer is frequently surprised at the conditions under which the battery is installed and the subsequent care it receives. A machine with moving parts, either rotary or reciprocating, will indicate almost immediately any trouble caused by lack of attention, but the storage battery will stand for a considerable length of time any abuse or rough handling. It does not give out suddenly, but continues to perform its work long after it should have received attention, and when the point of failure is reached, it may be seriously damaged.

For this reason, it is most advisable and more economical to give the battery from the very beginning, the attention and care it should receive. The amount of labor and material required is small, and offsets many times over the expense of too frequent renewals of plates. This view of the situation is frequently given small consideration by the operating companies, and in this article I will endeavor to show some methods of the care and operation of a battery in telephone service.

INITIAL CHARGE.

Assuming that the battery has been installed and the elctrolyte added to the cells, the first step in putting the battery into commission is the "initial" or first charge. It is extremely important that this charge be properly given and carried to completion. The positive pole of the generator, or charging source, must be connected to the positive terminal of the battery, as charging in the wrong or reverse direction will always result in serious and permanent injury to the plates. The polarity of the charging source can best be determined by a voltmeter, and the positive and negative plates of the battery are readily recognized by their color, the former being brown, and the latter a light gray.

The length of time taken in the initial charge cannot be exactly stated, but approximately speaking it consumes from forty-five to fifty-five hours at the normal rate or its equivalent in ampere hours, i. e., if the charging rate was reduced fifty per cent, it would take twice as long as if the normal rate was used, but the number of ampere hours would be the same in each case. Charging should begin at the normal rate immediately after the electrolyte has been added to the cells, and should preferably be continuous, until there is no further increase either in the specific gra-

[1]Abstract of paper read at Southern California Independent Telephone Convention, January 23, 1909, Pomona, Cal.

vity of the electrolyte and the voltage over a period of ten hours, and all the plates are gassing quite freely. These readings should be the only guide to the determination of the end of the initial charge, and whereas the approximate time in hours has been mentioned, even the maximum limit given may be increased if there are any interruptions to the charge or the plates have been standing in electrolyte for any length of time before charging commenced.

It is advisable in all cases to follow this first charge closely by taking readings of the gravity, voltage and temperature of the electrolyte of one or two pilot cells at least once every hour, and it is well to forward a copy of these readings to the nearest office of the manufacturer, for confirmation that the charge has been thorough and properly conducted.

In addition to the readings on one or two pilot cells, all the remaining cells should be carefully watched in order to ascertain that they are gassing. If any are not, these cells should be examined at once and the cause of the trouble removed. The temperature of the electrolyte should also be watched and at no time should it be allowed to exceed 100 degrees Fahrenheit. If there is any tendency to closely approach this figure, it is advisable to either decrease the charging rate, or if this does not have any effect, to stop the charge entirely and allow the cells to cool.

As soon as the operator has satisfied himself that the charge has been completed according to the conditions mentioned, a reading of all the individual cells should be taken. It will be noted that the voltage at the end of charge, with normal charging current flowing, will vary between 2.50 and 2.70 volts, and hence it is selfevident that a maximum figure and not necessarily a fixed value should be reached. The readings of the specific gravity will show that in the beginning the gravity dropped rapidly for several hours and then gradually rose to the proper value, 1210.

It might be mentioned here that with some types of cells, especially those containing what is known as the "pasted" type of negative, the electrolyte added to the cell before the beginning of the initial charge, has a gravity of 1170, while the standard "box" negative used in the larger cells, calls for 1210 electrolyte, but with both types, the gravity at completion of this charge should be 1210 at a normal temperature of 70 degrees Fahrenheit.

If any of the cells should happen to have a gravity lower than 1205 or higher than 1215 at this temperature, the electrolyte should be adjusted by adding acid in the one case, and pure water in the other. If all the conditions mentioned here have been fulfilled in every detail, the operator can safely assume that the battery is ready for regular service, and we can now proceed to the important points in connection with the subsequent care and operation.

CHARGING.

Proper charging is the most important part of the operation of a battery, and in the past much has been said and written about it, but even at the present time, especially in telephone service the evil of excessive and unnecessary charging exists.

Aside from the wasting of power, which is always an item of expense, especially as the majority of telephone companies purchase energy from outside sources, there also exists the more serious consideration of wasting away of the plates. The reason for this unnecessary and excessive charge has never been entirely apparent to the manufacturer. We can only conclude that either the operator is generously inclined toward the battery or excessive charge is considered the panacea for everything that occurs, or is likely to happen.

There are two general reasons for charging:

First, to put back the energy taken out on the previous discharge and be ready for another discharge.

Second, to keep the battery in good condition and obtain maximum life from the plates.

The first case illustrates what is known as the "regular charge," and the second, the "overcharge." The regular charge restores to the battery all the energy taken out on the previous discharge, while the "overcharge," given weekly or bi-weekly, as the case may be, evens up any irregularities that may exist in the different cells. The charging of a battery is a simple matter, but the vital point is the proper time at which to terminate it. The end of charge is detected in three ways: First, the increase in voltage; second, increase in specific gravity; and third, the amount of gassing.

Voltage Method—During charge, the cell pressure gradually increases, until, when the battery is fully charged, there is no further rise, irrespective of the length of time that the charge is continued. The point at which there is no further increase in voltage is known as the "maximum voltage." At one time, there existed a general idea that it was necessary to charge to a fixed voltage, but, happily, this incorrect method is gradually passing away, and it must be understood that the "maximum voltage" is not fixed in any way, but on the contrary, the actual value will vary, depending on the age of the battery, the temperature, the specific gravity of the electrolyte and the charging rate.

The disadvantage of using the voltage method only, lies in the fact that any variation in charging current will necessarily cause a change in cell pressure, and furthermore, it is very difficult to make temperature corrections, the voltage at times of high temperature being much lower than normal, while the reverse is true of low temperature.

Specific Gravity Method—During the discharge of a cell, there is combination between the acid in the electrolyte and the active material of the plates, the latter becoming somewhat sulphated. There is also a gradual reduction in the specific gravity of the electrolyte, and during the charge, the reverse happens, the acid leaves the plates and the specific gravity of the electrolyte increases. This rise and fall of gravity, due to charge and discharge, is directly proportional to the ampere hour input or output, and any variation in rate of charging or discharging current has no bearing whatever.

It is necessary in using this method, however, to make some corrections, that is, for temperature and evaporation. The temperature correction consists in adding or subtracting one point for a variation of every three degrees (Fahrenheit), above or below normal temperature or 70 degrees Fahrenheit. If

the specific gravity at 70 degrees Fahrenheit is 1205, at 55 degrees Fahrenheit, it would be 1210, and conversely at 85 degrees Fahrenheit, it would be 1200. Variation due to the evaporation can also be corrected by adding each day the necessary amount of pure water to keep the electrolyte at a predetermined level, preferably ¼ of an inch above the top of the plates. There might also be the objection that a hydrometer is not as easy to read as a voltmeter, but the newer type of instrument has an increased range, and there is less chance of error than heretofore.

As the variable features of the gravity method are so easily corrected, the reasons for preferring it to the voltage method are self evident, but it must be understood that both should be considered, as one serves as an excellent check on the other.

Gassing—As a battery is charged, there is some gas given off, little or none in the beginning, gradually increasing, while toward the end, the gassing is more or less violent. While this gassing may, at times, help as a guide, it is impossible to depend on it for any accuracy, and it is only used where local conditions prevent the adoption of either of the first two methods.

Color of Plates—The color of the plates may serve as a partial guide to experienced battery men, but this is only a check on the charging methods used, and not for any individual charge as the variation in color, from a state of charge to that of discharge is very slight.

Pilot Cell—When a battery has been installed and the initial charge completed, the first essential point is the selection of a cell as a guide to the operation, known as a "pilot cell." This "pilot cell" should be so chosen as to be of easy access, but should not be at the end of a row. It should also contain plates that are of the same age, and if the battery is made up of plates of different ages, a cell containing the older plates must be used. Readings on this cell should be taken frequently in order that the operator may know, at all times, the state of charge or discharge of the battery. The height of the electrolyte in this cell must be kept at a constant level, either by hand or automatically, by adding a little water from time to time. Water added in this way should be put in at least once a day to avoid a sudden fall in gravity.

It is always well to mark this level of the electrolyte, either by painting a line on the outside of the glass jar, or if the cell in question is installed in tanks, an "S" shaped piece of lead, hanging from the glass supporting plates will answer the purpose. When cells are not equipped with the full number of plates, naturally the variation in gravity over a cycle of charge and discharge is necessarily reduced, because of the excess electrolyte. In order to avoid any chance of error because of this decreased variation, it is advisable to displace the excess electrolyte by using a specially constructed lead tank, or if the plates are assembled in glass jars, a wooden block, weighted and properly treated, may be used. Once a pilot cell has been selected, it should not be charged unless for special treatment or repairs.

Readings might be taken on all the cells to check up the operation, but we have found by experience that it is not necessary, and that one cell may be taken to represent the others. Readings of all cells would also entail coniderable labor on the part of the attendant.

General—In general, a battery should receive a "regular" charge when it is from one-half to two-thirds empty, and if it is necessary to give a regular charge daily, an "overcharge" should be made once a week, or bi-weekly if the regular charges are not given so often.

It is not usually advisable to charge until the specific gravity has dropped at least fifteen points below the maximum reached on the previous overcharge for a cell in which all the plates are installed or where a displacing tank is used in a cell partially filled with plates. If the displacing tank is not used in a partially equipped cell, this limit should be restricted to a ten point drop. If the voltage method only is used as a guide, it is almost impossible to state when a charge should be started, as the cell pressure varies with the rate of discharge. Consequently, this characteristic of a storage battery cell demonstrates the superiority of the specific gravity method.

Regular Charge—This charge should, in all cases, where it is possible, be given at the normal rate. If lower rates are used, the charging consumes more time, and the increase in voltage is so small, it is more difficult to detect the cutting off point or completion of charge. Higher rates of charge need very careful watching in order to detect the proper point for cutting off the current, and if kept up after the cell is charged, they cause abnormal temperature rise in the cell, furthermore, the violent gassing tends to wash out the active material of the plates.

The charge at the normal rate should be continued until the gravity in the pilot cell has risen to within five points of the maximum obtained on the previous overcharge. If no displacing tank is used in a cell partially equipped with plates, the charge must be continued until the gravity is within three points of the maximum. The voltage will also rise until it is .05 to .10 volt per cell below that figure reached on the preceding overcharge, the charging rate being the same and constant in both cases. Furthermore, all the cells should be gassing moderately, but not so violently or freely.

Overcharge—When it is found necessary to charge a battery daily, the overcharge should be given once a week and preferably on the same day of each week. If the battery is charged less frequently, the overcharge should be given bi-weekly. In both cases, the charge should be continued until both the gravity and voltage reach a maximum value, and show no further increase for one or two hours and all cells are gassing freely. It should be carefully noted that these values are not necessarily the same at the end of each overcharge. No attempt should be made to reach a fixed value, but the charge should be continued until neither voltage nor gravity will rise any higher, irrespective of what figures are reached.

It will be noticed in these overcharges that the cell voltages will vary throughout the life of the plates, the values varying between 2.55 and 2.60 at normal temperature— 70 degrees Fahrenheit—when a cell is new, and as low as 2.40 when the age of the plates

has increased. The effect of temperature as stated before will also be very marked.

Although excessive charge is to be particularly avoided on account of the detrimental action on the plates, it might be well to state that these periodic overcharges, instead of causing any injury, are very beneficial and necessary. The necessity of continuing these overcharges, for an hour or two, will be readily recognized from the fact that unless the charges are so carried through, it would be difficult to obtain the true maximum value. Furthermore, the long overcharge is necessary in bringing up any cells that may have dropped behind and become temporarily less efficient than the others. Naturally, if the interval between overcharges is lengthened, the greater the variation there may be between the different cells, and it is advisable in all cases to make it a practice to overcharge periodically weekly or bi-weekly, according to the work the battery is called upon to perform. It is self evident then, that the overcharge sets a fixed standard for the subsequent operation of the battery and especially for the determination of the end of subsequent regular charges, but on account of many variable characteristics it is not well to use this fixed standard more than two weeks and hence, this is the longest time that any battery should run without an overcharge irrespective of the work it does.

DISCHARGING.

Just as there is an increasing voltage during the charge of a battery, conversely during discharge, there is a decrease. This decrease is very slight during the greater part of discharge and very gradual, but it is very marked toward the end. The limit is reached, if the battery is discharging at the normal rate, when the voltage has fallen to 1.75 volts per cell.

With rates other than normal, however, the limiting voltage varies, as does the drop in gravity and capacity in ampere hours. At rates higher than normal, the voltage at the end of a complete discharge is lower and the fall in gravity and the ampere hour capacity is also less. The fall in gravity is an excellent indication of the amount taken out during discharge, and this is especially true when the rate of discharge current varies over a considerable range.

With a cell fully equipped with plates, the drop in gravity is about 35 points for the full eight hour or normal capacity, and as the fall in gravity is independent of the rate of discharge, and directly proportional to the number of ampere hours taken out, the state of discharge of the battery can be readily calculated at any time, providing the maximum at the end of the previous overcharge is known.

If there are less than the full number of plates in a cell, there will be an excess of electrolyte, and consequently the drop in gravity will be less. In order to get as wide a range as possible, and thereby increase the accuracy of readings, the displacing tank should be used.

For determining the limits of discharge at any given rate, the voltage and gravity should both be taken into consideration, for, whereas the gravity drop, especially in the form of the gravity limit curve shown, Fig. 1, is a very ready method of showing the discharge limit as well as the percentage of capacity taken out, it does not necessarily show the actual capacity, and the voltage should be ued as a protection in case the capacity of the battery in question is below its rating. In general, a cell should not be discharged below its ampere hour capacity, neither should it be discharged at rates higher than it was intended to work.

Floating—"Floating" has been very common in lighting work, partly for regulation, and also to act as a ready reserve in case of any interruption of the prime movers or other points of the system, to automatically take care of the load. The term "floating" is generally applied to that method of operation where the battery is connected to the generator bus, but the voltage of the generator is so adjusted that the battery will not take care of any continued charge or discharge, although it may take care of any rapid fluctuations and thereby keep a steady load on the generator. Floating has been used in telephone service more or less recently, but its use is frequent, especially in such exchanges where only one battery is installed with a generator.

It is readily recognized that the best practice is to charge during times of the heaviest exchange load, as the generator is then working at its best efficiency. If

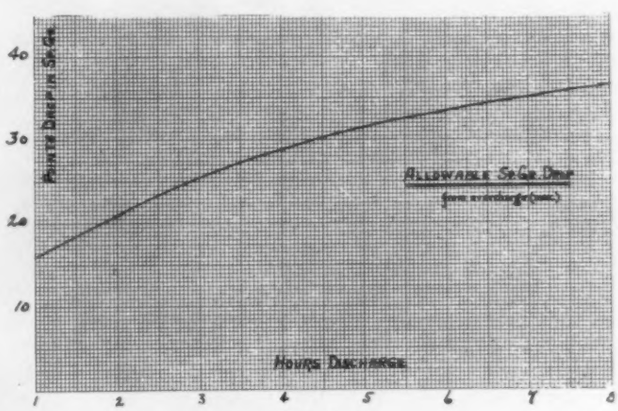


Fig. 1.

the battery has been charged, and if the load on the exchange still warrants the running of the generator, the current on the machine is reduced so that it is just equal to the exchange load, and the battery is connected to the bus ready for any emergency. It also acts as a regulator, preventing any cross talk. The battery is generally floated in this way until such time as the exchange load drops off to a point where it is uneconomical to operate the generator. Care should be taken to float the battery in such a manner that the battery will receive only sufficient charge to compensate for the discharge, as floating at too high a point causes excessive charge, while floating at too low a point results in discharge.

Th result of investigation on a large number of plants has demonstrated that if the voltage is maintained at an average of 2.08 volts per cell, the battery will be kept at the proper point. It should be especially noted, however, that the battery should not be floated when the gravity is at its maximum density, for example, at the end of an overcharge, as at that time the fluctuating charges will cause gassing and excessive

charge. It is far preferable to float at a point equivalent to the end of the "regular" charge. There are several methods used for watching the correct floating point.

(a) A very simple device is a recording voltmeter, with the proper range, connected directly across the battery terminals. This meter is generally designed for a 24-hour record and can be placed directly at the switchboard. If connected across 11 cells, the proper average for floating should be 23 volts, and with 22 cells, the corrected figure is 46 volts. The curve on the dial shows at once whether the floating has been too high or too low.

(b) Where it is possible to do so, periodic readings of the pilot cell gravity during the floating period act as a ready tell-tale. If the battery has been floated properly, there will be no change in gravity over the floating period, whereas a rise or fall will denote that the voltage of the generator has been too high or too low for the battery during this time and should therefore be adjusted.

(c) Frequent readings of the battery ammeter would also serve as a guide, but this demands the constant attention of the operator, when his time and labor are necessary in other directions. There have been several meters of the integrating ampere-hour type designed and put on the market that deserve special attention. Two meters, one manufactured by the General Electric Company and the other by the Sangamo Electric Company are very similar in construction and have been found very reliable. The instrument manufactured by the General Electric Company is of the mercury motor type and is an improvement on the old Halsey ampere hour meter. This instrument is equipped with a register having a sweep hand which may be set back to zero whenever desired. Usually the meter is set at zero at the end of charge, and kept there by adjusting the bus pressure. It is so constructed that if the current reverses, that is, from charge to discharge, the rotation of the meter will be in the reverse direction and at the same rated speed per ampere in either direction. From the portion of the pointer it can be readily noted whether the charge exceeds the discharge or vice versa.

Briefly, the principle of operation is based upon the fact that electric current passed through the disc or cylinder immersed in mercury, where it is cut by a field from a permanent or electro magnet, will cause the disc to rotate in a direction at right angles to the flow of the current, the torque being proportionate to the intensity of current flow, assuming the field constant.

AUXILIARY APPARATUS.

On account of the ease in operating by the gravity method, especially by the use of a pilot cell, some special apparatus has been developed. As stated previously, specific gravity readings are only correct indications of the state of charge or discharge when the temperature and height of the electrolyte remain constant. Any change in temperature must be compensated for, so also any variation in the height of electrolyte. This may be done by calculation, but this is a laborious proceeding and consequently apparatus has been designed to accomplish the same purpose automatically.

Compensating Hydrometer — This instrument is similar in general appearance to the hydrometer in use for many years. It has in addition, however, a small inner bulb, connected by a small tube to the electrolyte of the cell. When the hydrometer is properly adjusted, the small bent inner tube is filled with electrolyte up to the bulb, which is filled with air. Any change in temperature of the electrolyte will cause a corresponding variation of the volume of air in the bulb, and expel from the hydrometer or draw into it a certain quantity of electrolyte. This will vary the weight of the hydrometer, and this variation compensates for the change in specific gravity of the electrolyte due to temperature changes. To properly adjust this instrument, a reading of the gravity of the pilot cell after charge should be taken and the temperature of the electrolyte noted. The gravity reading should then be corrected to a standard temperature of 70 degrees Fahrenheit.

When the correct reading has been calculated, insert the compensating hydrometer in the electrolyte of the same cell, then remove it, and, by inverting it, allow the acid in the small tube to enter the bulb. This operation should be repeated until the compensating instrument reads the same as the corrected reading of the standard hydrometer.

A comparison of the standard and compensating instruments should be made on the following day to see if the adjustment is fixed, and if it is not, a further adjustment is necessary. For the first month it is desirable to check the compensating instrument weekly with readings of the standard corrected for temperature, but after that the comparison is not necessary so frequently. Naturally, it requires some time for an instrument of this character to adjust itself to the temperature of the electrolyte, so if it is moved about from cell to cell, at least fifteen minutes must elapse before any reading is taken. As a general rule, it is preferable to keep it in the pilot cell and take individual cell readings weekly or bi-weekly, as the case may be, with the standard hydrometer.

Automatic Cell-Filling Device—Constant evaporation from the surface of a cell will vary the amount of electrolyte, and naturally the specific gravity readings are affected. In some cells the amount of evaporation is as high as 3 per cent per week, and this will change the electrolyte approximately 8 points without any charge or discharge having taken place, producing an error of anywhere between 20 and 40 per cent, depending on the type of cell. This error may be corrected if the attendant adds sufficient water to the electrolyte daily to keep the height constant, but quite an error can be introduced if this proceeding is omitted for several days.

The automatic cell-filling device was developed by the Electric Storage Battery Company to insure a constant level of the electrolyte. Its operation is similar to that of the automatic float-valve, and, being constructed entirely of glass, with the exception of the rubber stoppers, is not acted on in any way by the acid fumes.

Signalling Hydrometer—Although the specific gravity method, as an indication of the state of charge or discharge, has been found to be the most preferable, it is, nevertheless, in some cases, impossible or troublesome for the attendant to take a number of readings

to determine accurately whether the gravity has reached a certain predetermined point, either on charge or discharge. Furthermore, it is necessary to make the temperature correction in each case demanding additional attention and time on the part of the operator.

The signalling hydrometer corrects automatically for temperature and gives notice at the switchboard, either by the ringing of a bell or the lighting of a signal lamp, that the gravity has reached the point that

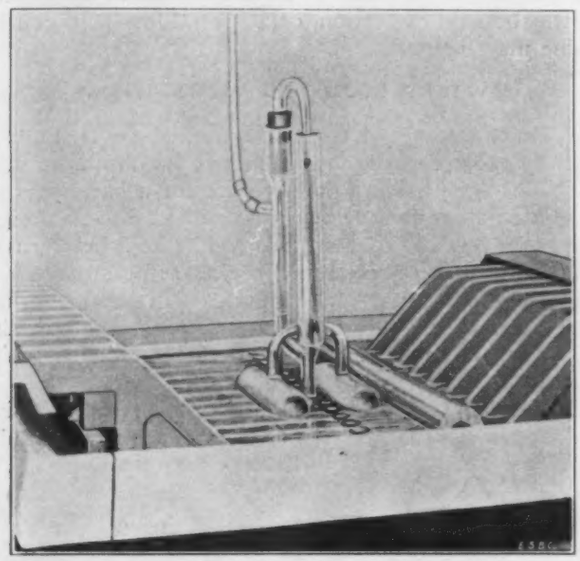


Fig. 2. Automatic Cell Filling Device.

the instrument is set for. The principle involved in the operation of this instrument consists in measuring by means of a balance the varying resultant weight of a bulb of constant volume immersed in the electrolyte. This bulb is filled with electrolyte, and as the temperature of the electrolyte of the cell changes, expansion or contraction of that in the bulb results and either some electrolyte is ejected or drawn into the bulb in such

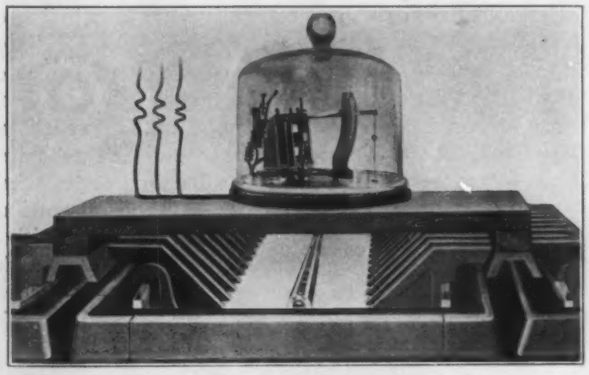


Fig. 3. Signalling Hydrometer.

amount as to cause the weight to vary inversely with the temperature.

Recording-Signalling Hydrometer—A further development of the signalling hydrometer is the recording-signalling hydrometer. The principle is precisely the same, with the additional feature that a permanent record is made of the battery operation and the personal equation of the attendant is checked at once. The moving mechanism or drum carrying the record is actuated by an eight-day clock so that a complete record of one week is obtained on each sheet.

Individual Cell Readings—From all that has been said about the advantage of reading the pilot cell frequently, it must not be inferred that these are the only readings to be taken. The readings of the pilot cell only serve as a guide to the regulation of the amount of charge and discharge the battery as a whole should receive, and, therefore, periodic readings of

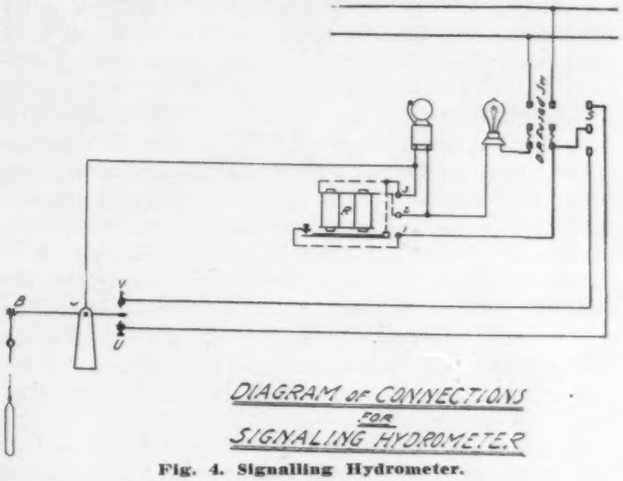


Fig. 4. Signalling Hydrometer.

voltage and gravity should be taken on the individual cells, the frequency of these readings depending on the number of overcharges the battery receives per month. In the first place, never take voltage readings on open circuit; they are of no value whatever. It is best to take the reading of the specific gravity of each cell on the day before the overcharge and at the same time in each case. An ordinary hydrometer will do for this purpose, as relative values only are desired. At the end of overcharge a voltage reading of each cell should be taken while the charging current is still flowing. If any falling off is noticed in any one cell relative to the others, this cell should be examined at once for

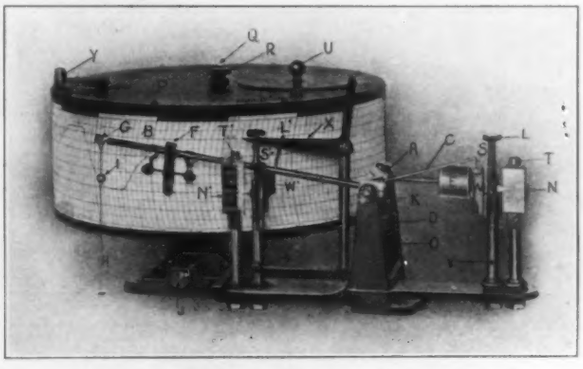


Fig. 5. Recording Signalling Hydrometer.

the possible cause of the trouble. These readings should be recorded on suitable forms and carefully kept on file.

Records—Too much cannot be said about records, as it is only by the careful keeping of them that a history of the work that the battery has performed throughout its life can be obtained. It sometimes happens that a battery is ready for renewals, and yet when

the question is being considered, there are no figures or facts to show that the equipment has performed the work for which it was installed, and quite often the blame is placed on the manufacturer when it does not belong there.

In general, the operation of any equipment or machinery that has a financial value should be carefully recorded, as in no other way can the maintenance be arrived at, and any figures are valueless unless they are founded on facts. In some cases it is the custom for the attendant to keep his records in a book, but I think that special forms so arranged as to contain the complete record of a week or longer are more advisable.

Inspection—Frequent inspection of the individual cells should be encouraged, but, of course, the frequency of inspection is dependent on local conditions. It is possible, however, in an 11-cell equipment to inspect all the cells thoroughly in approximately two hours. This time need not be spent continuously in the battery room, but may be scattered throughout the day. If the cells are of a small type, this time will be considerably lessened.

In general, it is well to get over all the cells at least two or three times a week, but I would advise that this work be performed even oftener, as frequent and close observations on the part of the attendant will do more towards his education than anything else. Aside from this feature, thorough inspection will always anticipate trouble, and this is certainly more satisfactory than the doubtful procedure of waiting for something to develop. Special attention should be given to the hanging lugs to see that they are not in contact with the adjoining lugs, and naturally any cells that read low at the time individual readings are taken should be carefully watched. The accumulation of sediment should be examined from time to time, and under no circumstances should it be allowed to touch the plates. This sediment can be easily removed from a battery made up of cells installed in glass jars by removing the elements, pouring off the clear electrolyte, washing out the sediment and replacing the element. This procedure, however, should only be performed when the battery is fully charged, and particular care should be taken not to allow the plates to become dry.

In the larger type of cells a special wooden scoop may be used to advantage and the sediment removed without disturbing the operation of the battery.

Another method of cleaning large cells is to draw off the electrolyte and thoroughly flush the cell with water so that the sediment will be stirred up. A syphon, preferably a 2-inch rubber hose, should then be inserted in the bottom of the tank so that the discharge will be as rapid as the inflow of water until the cell is free from sediment. The water in the cell should then be replaced by electrolyte.

Low Cells—The presence of low cells is readily detected by (1) falling off in specific gravity or voltage, relative to surrounding cells, (2) lack of gassing at the end of overcharge, and (3) by the color of the plates. The cause of the trouble should be sought out and removed at once.

Treatment—If the trouble is discovered immediately, it will be possible to restore the cell to the proper condition by the following overcharge. If this overcharge does not entirely restore it, the second overcharge may, or it might be necessary to charge the cell separately.

The simplest method is to overcharge the entire battery, but care must be exercised not to do this to excess. It is preferable to cut the cell out for several discharges and put it back in circuit again before beginning each charge. In this way the low cell receives the benefit of several charges without going through any discharge. Another method is to charge the cell from some outside source, either using the charging generator with a water rheostat in circuit or by cutting down the field excitation, or a special low-voltage machine may be used.

BATTERY ROOM AND VENTILATION.

An exceedingly important item is the design of the battery room and the proper means for obtaining ventilation. The normal temperature for a battery is 70 degrees Fahrenheit, so the aim should be to so design the room that the temperature can be kept between 50 and 80 degrees Fahrenheit. If the temperature is too high excessive wear on the plates will be the result, and whereas a cold room causes no harm, still the capacity of the battery is temporarily reduced while operating at low temperatures.

Ample ventilation should also be provided to insure a sufficient circulation of the air so that all stands, insulators, cells, etc., may be kept reasonably dry. At the end of charge a slight percentage of the acid is given off when the cells are gassing, and as acid is hydroscopic and will collect moisture from the atmosphere, keeping all surfaces where it settles damp, ample means must be provided for carrying off the gas and particles of acid. The deposit of acid on the insulators should be carefully watched, as this will start electric leakage, which will eventually cause electrolysis on the lead lining of the tanks, if they happen to be used, and the tanks will leak. Naturally, when the wooden shell of the tank is saturated with acid, deterioration is more rapid. It is not sufficient to wash off with water in order to obtain dryness, but, in addition, all parts, namely tanks, woodwork, insulators, floor, etc., should be washed occasionally with a solution of bi-carbonate of soda until all the acid is neutralized, and then remove with a stream of water all traces of the soda. Furthermore, if the gases given off on charge are closely confined, there is danger of an explosive mixture, and for this reason a naked flame should never be brought into the battery room when gassing is going on. The simplest method of ventilating is to make suitable outlets in the ceiling with a number of inlets near the floor level, about twice the area of the outlets. In some cases where the outlets and inlets cannot be properly arranged, forced draught is necessary.

Canadian telegraph lines, according to a report presented to the Dominion Parliament at Ottawa, recently, are not profitable. The receipts are $122,432.53, while the expenses amount to $386,567.34. In Yukon and northern British Columbia considerable difficulty is experienced through snow slides, rock slides, blizzards, etc., and a proposition is under consideration to install wireless systems where wire trouble is most prevalent.

LAW OF THE TELEPHONE.

BY EMERSON W. READ.

Reference has heretofore been made in these articles to the interference of trees with the stringing of wires by enterprises making use of wires in the regular course of business. From cases actually occurring and reported in the various courts of appeal it appears that such interference can be treated in three classes, namely:

1. When trees wholly stand on private property.
2. When trees root and stand on private property, but overhang adjoining property or highways.
3. When trees wholly stand on highways.

In the first class courts have no trouble in determining rights questioned on the interference with trees by employees of a company stringing its wires through the foliage. Too often has it been held that, should a telephone company cut away or trim trees wholly within the boundaries of private property, such company is liable for the damage done to the owner of the tree. In such instances the company should enter into an agreement with the owner relative to stringing wires through the tree, or else, actually avoid it. A reliable decision on this point is rendered in Tissot v. Great Southern Tel & Tel. Co. (2 Am. Elec. Cas. 286). There the company's servants cut away foliage in a valuable magnolia tree to the extent of about a thirty-foot circumference. It was shown that the company's servants had committed trespass, both in entering the premises and in cutting the tree. This follows directly as a consequence of the rules of law applicable to all private property, and especially the one insuring to an owner protection in the enjoyment of his property.

Some difficult questions arise in dealing with trees that protrude into the highway. On first impression it would seem that a company, owning a franchise to string telephone wires in a highway could, without further negotiation, trim trees that actually and unavoidably interfered with the company's operations. This was the fact in Southwestern Tel. & Tel. Co. vs. Branham, a Texas case (74 S. W. 949). There it was determined that trees so protruding cannot be trimmed and chopped away summarily. First the municipal government must declare such branches to be public nuisances and abate them as such. In the absence of any finding by the proper authorities that such constituted a nuisance, they cannot be dealt with by the company as such.

Care must be taken in trimming trees back to the owner's line. Any unnecessary cutting or spoliation beyond the line, or even an intrusion upon the land of the owner, in carrying on the authorized work, will constitute a trespass. The case of Memphis Bell Tel. Co. vs. Hunt (1 S. W. 159) suggests that limbs of trees protruding from private grounds into the highway might be trimmed from ladders.

Another condition arises, too, with respect to trees of this class. Trees, in their spreading, might encompass wires long in place and hung at a time when no such trouble or source of annoyance existed. This was the Branham case doctrine. The company, under such conditions, cannot take summary action, however. True, it has a suit for damages, yet its relief must be had from the hands of the municipality, to-wit: have the city remove the obstruction.

From this it cannot be implied, however, that owners of trees are entitled to space above the highway at their pleasure. In that particular they owe a duty to travellers and the municipality to use reasonable care to prevent trees on his land becoming a menace or a danger to those using the highway as travellers on the street or as companies erecting poles, wires, car systems, and the like.

It may be said by way of modification that the rules above stated differ with the various state jurisdictions. For instance, Michigan has decided (Wyant vs. Central Tel. Co., 123 Mich. 51) that notice need not be given to either owner or municipality by a company stringing wires under a proper franchise if such limbs protrude over the owner's line and obstruct the hanging of the necessary wires.

Questions arising out of the third class shown above are subject to much legal difficulty in solution. Two elements are to be regarded in dealing with cases of that nature: One, does the abutting owner own to the center of the street, his fee being subject to the public's easement of thoroughfore? Two, does the municipality own the fee of the street absolutely?

Generally speaking, telephone companies cannot trim trees growing wholly on the highway if the abutting owner owns to the center of the street. This is the general rule, though it has so many modifications that it now represents an elementary rule much departed from in the course of the development of modern rules.

In cases in which the municipality owns the fee simple title to the street one rule predominates. The abutting owner may be ignored (Wyant case) and the company may do reasonable and necessary trimming subject solely to the regulations of the municipality.

On the whole, the rules regulating the trimming by companies which string wires are reasonable and proper. But harsh rules have been established in some states. New York and Connecticut in the East, and Ohio and Illinois in the north central part of the United States, have come to such determinations as this, "a telephone company is liable to the owners of the trees even where the trimming does not go beyond what is necessary in the reasonable prosecution of the work of construction." Generally the states merely require that reasonable and lawful trimming by the companies be done. Unnecessary cutting of branches constitutes a trespass either if the branches are cut back and across the line of the owner, or if too large a circumference of foliage is cut in proportion to the needs of the wires.

State constitutions provide that the state governments shall not interfere in matters of municipal government which are purely municipal matters. Such a matter is the ordinance of a city prohibiting the injury of trees and encouraging their growth. An ordinance enacted by the Supervisors of a city providing a penalty for the cutting, trimming and breaking of trees, their limbs and foliage, is a police regulation and can be enforced against companies and individuals indiscriminately. A case of that nature arose in New Jersey when the state of New Jersey attempted to show such an ordinance (enacted by Orange Township) to be without the police power and invalid (61 N. J. L. 202).

JOURNAL OF ELECTRICITY
POWER AND GAS

PUBLISHED WEEKLY BY THE

Technical Publishing Company

E. B. STRONG, President
E. M. SCRIBNER, Vice-President and General Manager
A. H. HALLORAN, Secretary and Managing Editor

DIRECTORS

R. J. DAVIS A. M. HUNT E. M. SCRIBNER C. L. CORY E. B. STRONG

604 MISSION STREET, SAN FRANCISCO.

TELEPHONE . . . . . KEARNY 918

TERMS OF SUBSCRIPTION

United States, Cuba and Mexico	per year,	$2.50
Dominion of Canada	"	3.50
Other Foreign Countries within the Postal Union	"	4.00
Single Copies, Current Month	each	.10
Single Copies, prior to Current Month	"	.25

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FOUNDED 1887 AS THE
PACIFIC LUMBERMAN, CONTRACTOR AND ELECTRICIAN

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Room For All

When people played the organ with their fists, when they could multiply only with the multiplication table before them, when hands did what is now done by heads, time and labor were of little consequence. Now, however, anything that saves time or work is no longer a luxury but an absolute necessity.

The judicious use of the telephone is a great saver of time, and consequently it is fast becoming indispensable. Likewise its injudicious use, such as by the stenographer during the noon hour, is a waste of time, but this is extraneous. Man's gregarious instinct is cognate with that of self-preservation, and it is satisfied by the telephone, whether in the case of the housewife in the city flat or the rancher in his lonely cabin.

Although the increase in its use has been great, yet there remains a demand for its services which existing companies cannot supply. There is still so much to be done that it seems futile to engage in internecine quarrels. The public wants service and cares little by whom it is given, so long as it is good. There never was a time so favorable for telephone development, nor is its field so limited as to shut out competition.

Competition, in its better sense of emulation, gives better service. It may even become co-operation in extending service, rather than opposition in limiting it. "Live and let live" is a better doctrine than "dog eat dog."

The field for the telephone is a broad one and there is ample room for all. A quart flask filled with alcoholic vapor will receive another quart of gasoline vapor without increase in volume, just as a glass tumbler filled with shot can hold a large amount of water without spilling. This is much like the case of the vegetable man who sells five bushels of big potatoes and one bushel of small ones from his original five bushel basket. With so many fields as yet undeveloped, however, there should be no necessity to duplicate lines except where public opinion demands better service or a better rate.

At a recent meeting of independent telephone men in Boston it was the consensus of opinion that there is a greater demand for telephone service than existing organizations can supply and that the plan of the independents will be to offer good service at fair rates and let competition take care of itself. We have often spoken of the great strides being made by independent telephone companies on the Pacific Coast. The fact that sixteen and one-half million dollars are to be expended by the Bell companies in improving their service goes to show that this competition is felt. As long as it results in improvement of service the public is satisfied.

CURRENT COMMENT

Wireless communication from Paris to Canada, a distance of over 3,000 miles, is maintained by the stations on the Eiffel Tower and at Glace Bay.

Wireless for the Orient is to be established by the United Wireless Company. A chain of wireless stations will be established from Vladivostok to Aden, to communicate with the steamships in the Pacific.

Coyote hunting by telephone is reported from Gridley, California. After crippling the animal a farmer telephoned to his neighbor that it was headed his way. The second farmer missed the coyote but telephoned to a third farmer who killed the animal.

Electric smelting of iron ore is to be tried on a commercial scale in Norway. The first installation includes two 2,500 h. p. iron furnaces and two 600 h. p. steel furnaces. Two phase current is to be used and the system of Otto Stolhane of Sudrika, Sweden, installed.

A big bond issue of $16,500,000 first mortgage and collateral trust five-per-cent sinking fund thirty-year gold bonds of the Pacific Telephone and Telegraph Company is being offered for public subscription at 95.5 and accrued interest, simultaneously in New York, Chicago, Philadelphia and Boston. The bonds may be retired at 110 on January 2, 1922, or any interest date thereafter. The new bonds are secured by a first mortgage, either direct or by deposit of securities on the entire plant and property of the company, subject only to $3,000,000 bonds of one of the constituent companies maturing in 1913.

The wireless telegraph as a life saver was called into service in summoning aid for the Pacific Mail Steamship Indiana, which went ashore at Port Tosco on the western coast of Mexico this week. While the ship was pounding on the rocks the cruiser West Virginia, Admiral Swinburne's flagship, saw the distress signals which were sent up, and immediately summoned by wireless the cruiser Albany, with the tugs Fortune and Navajo, which were in Magdalena bay. The ships of lighter draft were able to go close to the wreck and take off the passengers and crew. The passengers were carried to San Francisco by the armored cruiser California. All news of the disaster until the arrival of the cruiser was by wireless telegraph.

An important telephone decision by the Indiana Supreme Court relates to the exchange of service through physical connection of rival lines. The court was asked by the complaining company to compel the defendant company to restore the connection which had been severed in order to enforce the payment of disputed tolls. The court held that a telephone company is a common carrier of messages, and when the owner of one system of telephones and exchanges has made physical connection between his and other lines and exchanges in the surrounding country under an agreement for interchange of service for an intermediate period, and each has developed his own telephone system with reference thereto, the courts will, upon a proper proceeding, restrain the owner of such telephone system from severing relations with a single one of the connecting lines and exchanges, or compel him to restore a severed connection. The court ruled, however, that the complainant should have paid under protest the amount claimed as due for tolls and then recovered the same; that this was his adequate remedy and for his failure to invoke this remedy he was not entitled to a writ of mandamus to compel restoration of connection. The court added that after actual physical connection has been made between the lines of two systems of telephones, the property of each is impressed with such a public interest that neither can disregard it.

Indiana telephone legislation provides that any telephone company organized in the State shall have power to acquire by lease or purchase the lines, exchanges, franchises, rights and other property, or any part thereof, of other telephone companies, or to dispose of by lease or sale its lines, exchanges, franchise rights and other property, or any part thereof, and also shall have the power to acquire and hold stock and bonds of other telephone companies. Until this recent amendment was made the law did not permit a company organized under the laws of Indiana to hold stock in any other company. On the other hand, the Central Union and other companies organized under the laws of other States have had such right and power. The amended law puts home companies on an equal footing with foreign companies and is expected to stimulate and strengthen the independent system in the State.

The telephone for train dispatching was explained in a paper read before the St. Louis Railway Club, on February 12th, by Mr. W. E. Harkness. The orders are issued verbally by the dispatcher to the operator or operators over a metallic circuit telephone line in place of being sent by telegraphy. By means of selective apparatus each station is called individually without signaling the other stations on the line. It has been found that the operators answer the selector bell more promptly than they do the sounder, due partially to the extra volume of sound given by the bell and also to the fact that it will ring until the call is answered. The accuracy of the telephonic transmission is clearly shown by the fact that the dispatching and reporting of trains on a large number of roads have been handled for a year or more by telephone without mistakes having occurred. Telephones are now used for train service over certain sections by the Lake Erie Alliance & Wheeling, the Pennsylvania, the New York Central & Hudson River, the Chicago, Burlington & Quincy, the Lake Shore & Michigan Southern, the Chicago & Northwestern, the Michigan Central, the Chicago, Milwaukee & St. Paul, the Northern Pacific, the Delaware, Lackawanna & Western, the Great Northern, the Chicago, Rock Island & Pacific, the Union Pacific, the Illinois Central, the Canadian Pacific, the Atchison, Topeka & Santa Fe, the Erie, the West Jersey & Seashore and the Virginia Railroads.

DEATH OF H. D. SCRIBNER.

Herbert Dudley Scribner, Pacific Coast manager of the Allis-Chalmers Company of Milwaukee, Wis., died at San Francisco on April 3, 1909, aged 44 years.

In the death of H. D. Scribner, the electrical interests of the Pacific Coast have lost a man who was not only a business associate but a friend and comrade—a man whose many years of hard work in the period of early development unquestionably entitled him to a place among the pioneers of the electrical industry in this section.

He came to the Pacific Coast from the State of Maine, twenty-one years ago, and at that time, although but 23 years of age, he already occupied a high position in the electrical business.

Shortly after his arrival here he built the first electrical road on the coast at Seattle, which marked the beginning of electrical development in that section of the country. For some time thereafter he was associated with Howard C. Holmes, constructor of the San Francisco Ferry Building and in connection with Mr. Holmes undertook some extensive operations. Electrical lines at Stockton and Tacoma

Herbert Dudley Scribner.

resulted from his efforts, and Vancouver, B. C., saw its first electrical railway constructed by him.

Among other engineering feats by which his name will be remembered is the line which connects Oakland and Haywards, Cal.

Following the above work he became associated with the San Francisco office of the Westinghouse Electric & Manufacturing Co., where he occupied an important position in the Power Apparatus Sales Department for many years. It was while he was with the Westinghouse Company that he received and accepted the offer of the Allis-Chalmers Company to take the management of their Pacific Coast business, which position he occupied at the time of his death.

Mr. Scribner's home was in Alameda, Cal., and he is survived by a wife and three children, two girls and a boy.

Services were held at his late home on April 6th, at which time his many friends and associates testified to the esteem in which he was held by numerous floral tributes; a large deputation of the San Francisco lodge of Elks, of which Mr. Scribner was a popular member, participated in the services.

PERSONAL.

F. H. Poss of San Francisco is at Victoria, B. C.

Thomas G. Grier, general sales manager of the Nungesser Electric Battery Company, has sailed for Porto Rico.

W. H. Whiteside, president of Allis-Chalmers Company, Milwaukee, Wis., arrived in San Francisco this week from Los Angeles.

A. M. Little has resigned as representative of Pass & Seymour to become general manager for the Mohawk Electric Company of Syracuse, N. Y.

E. H. Stevens has resigned as general superintendent of plants of the Public Service Corporation of New Jersey to become vice-president and general manager of the Bird-Archer Company, manufacturers of boiler compounds, 90 West street, New York.

NEWS OF THE STEAM ENGINEERS.

A large audience composed of members and friends of California No. 3, National Association of Stationary Engineers, attended an illustrated lecture on the "Parsons Turbine" at the association rooms Wednesday evening, March 31st. The subject was ably handled by Mr. Charles W. Baker, who prefaced his remarks by giving a short history of the turbine from the days of Hero, to the gradual evolution of the modern parallel and double flow turbine, illustrating his remarks by lantern slides.

The Educational Committee of the association announced that on Wednesday evening, April 7th, a talk on "Motors" will be given at the association rooms by Mr. J. Henry Klink of the Westinghouse Electric Company, which promises to be of much interest to the engineers and their friends. A general invitation to attend is extended by the association to anyone interested in the subject.

San Francisco No. 1, N. A. S. E., at its last meeting decided by unanimous vote to affiliate with the California State Associaiton, N. A. S. E. Steps to that end will be taken immediately, and delegates elected to attend the State convention in June coming.

TRADE CATALOGUES.

The General Electric Company has issued Bulletin No. 4654 devoted to the description of G. E. Section Switches.

Bulletin No. 4655, from the General Electric Company, gives a description of an electric furnace adapted to tempering and annealing.

An attractive booklet from the General Electric Company states the advantages of tantalum incandescent lamps for lighting railroad cars.

Westinghouse Multiple Tungsten lamps for alternating or direct current circuits are illustrated and described in Circular No. 1160 from the Westinghouse Electric and Manufacturing Company.

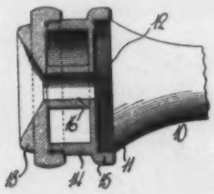
Circular No. 1164 from the Westinghouse Electric and Manufacturing Company is devoted to their type M. S. alternating current polyphase induction motor. This is a constant speed squirrel cage rotor, especially designed for mill service.

Bulletin No. 3765, entitled "Bell Ringing Transformers," from the General Electric Company, illustrates and describes a small transformer for use in connection with the operation of electric call bells, eliminating the usual battery for this purpose.

The General Electric Company in folder No. 3761, entitled "Extension Diffusers," describes a diffuser for use in connection with incandescent lamps designed to meet the demand for an incandescent lamp fixture, embodying aesthetic as well as the scientific principles required for certain high grade incandescent lighting.

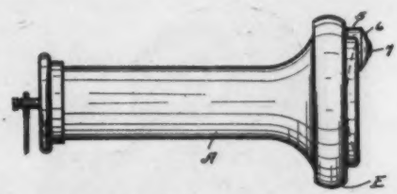
PATENTS

915,625. Telephone Receiver. Alcorn Rector, New York, N. Y., assignor to Rector Help-A-Phone Company, New York, N. Y. The combination with a telephone receiver of the usual type, of a ring interposed between the end of the receiver and its ordinary ear piece, the said ring being adapted to fasten



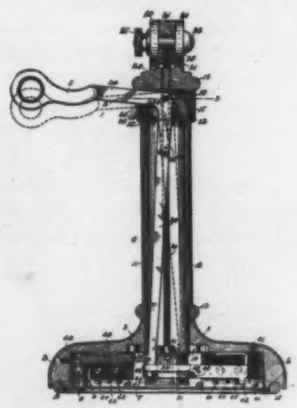
to the receiver over the diaphragm, having its outer end screw threaded to receive the usual ear piece, and having a central sound bore corresponding with the bore of the ear piece.

915,079. Telephone Receiver. James Dixon, Cleveland, Ohio. A telephone receiver having the usual opening therein for delivering sound waves and provided at one side of and a suitable distance from the said opening with a lug arranged



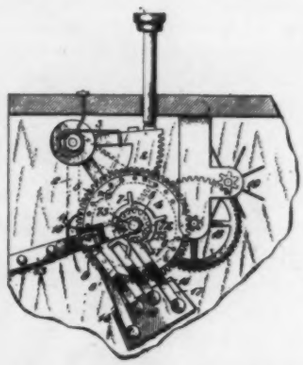
wholly at the said side of the opening and in position to be pressed against the bony structure of the head of a person in suitable proximity to the outer ear of the organ of hearing to which the telephone receiver is to be applied.

915,077. Desk Stand. William W. Dean, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, Chicago, Ill. In a desk set, the combination with a stand having a tubular standard and a hollow base, of a hook switch lever mechanism within said standard and suitably pivoted near its upper end upon which the receiver is adapted to be suspended, a portion of said hook-switch lever mechanism extending

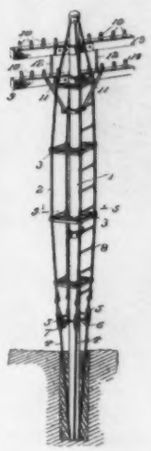


downward through the tubes with its lower end adapted to have a horizontal reciprocating motion, a set of switch springs inclosed by said base and disposed in a horizontal plane to render their contacts visible from beneath, the lower end of said switch-hook mechanism being adapted to actuate said springs by its horizontal movement to control the circuit therethorugh, substantially as described.

915,578. Machine for Recording Telephone Calls. Hermann Fascher, San Diego, Cal. In a telephone call recorder, the combination with the central switchboard and line wires, of connections therewith through receiver switch of subscriber's telephone, a call transmitting mechanism and a call

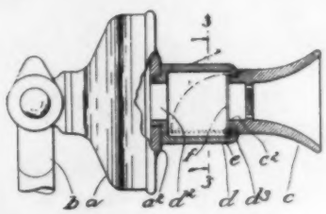


recording mechanism, each of said mechanisms being connected with said receiver switch, and a double source of energy at central for the operation of said call recorder mechanisms.



915,305. Telephone Pole. Eugene J. Newhall, Waupaca, Wis. In combination, a pole, braces secured to the pole at intervals in its length, guys having connection at their upper ends with the pole and deflected by means of the braces, stays having connection at their lower ends with said pole, turn buckles connecting the upper ends of the stays with the lower ends of the guys, and means connecting the turn buckles in series to prevent their movement when properly adjusted.

916,245. Telephone Transmitter Attachment. Richard L. Woodward, Jersey City, N. J. The combination with the main casing and mouth piece of the transmitter of a telephone, of an intermediate casing detachably connected with the main casing and with which the mouth piece is detachably connected, said intermediate casing being provided transversely



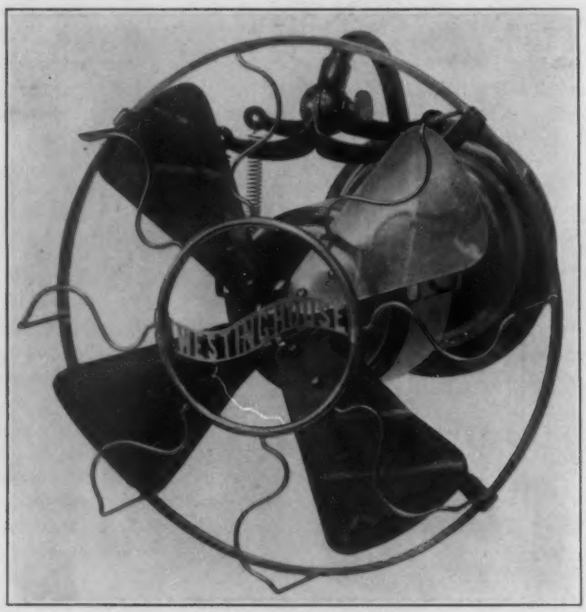
of the bottom portion thereof and of the outer end thereof with a rod which projects therefrom at one side and is provided with a handle, and a plate secured to said rod within said intermediate casing and adapted in one position to close the transmitter, said plate and rod being provided with a spring which normally holds said plate in position to close the transmitter.

INDUSTRIAL

TELEPHONE BOOTH FANS.

Everyone is familiar with electric fans and knows what a relief they are in the summer time for offices and for houses, but their use is being extended to another field, where they are as much appreciated. To anyone who has occasion to use long-distance telephone booths at all it will be a source of pleasure to know that the Westinghouse Company is now manufacturing an 8-inch fan which can be used to keep the air in circulation in the booth.

These fans look like a toy; some people have facetiously said they would do for a watch charm, but they are far from being mere toys. The blades spread but 8 inches, while the motor is not half the size. The motor is supported by springs from an arm screwed to the side of the booth, and may be tilted or turned through a wide range of directions. The springs prevent any transmission of vibration from the motor to the telephone, and, as the fan is noiseless, the effect



Telephone Booth Fan.

is to blow the impure air out of the booth and bring in fresh without in any way affecting the use of the telephone. As booths are usually provided with several small holes the air is circulated even with the door closed, but of course the best ventilation comes when the door is opened. This insures users against breathing the same air someone else has just been using. We notice it speedily if it is a man who has been using tobacco, but we are not aware of the contagion that there may be given off by a sick person, whether afflicted with some loathsome disease or with a less dangerous sickness. The fan is kept running all the time and consumes about one-quarter of the current required by an ordinary 16 candle-power carbon lamp. A regulating switch is provided in the base of the bracket from which the motor is suspended, by which the speed may be adjusted to three values, any one of which may be used for running indefinitely. The movement of the air is dependent upon the speed of the fan, as is the amount of power required. In some booths the lowest speed of the fan is sufficient. At the usual rates for power, 10 cents a kilowatt hour, it would cost a cent and a half to run it all day long.

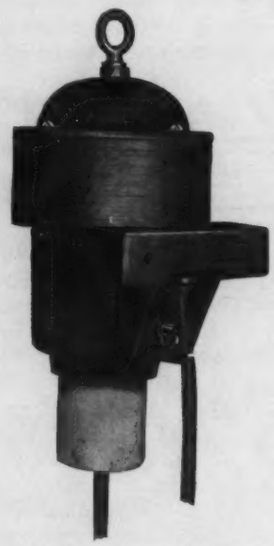
INSULATING TRANSFORMER FOR TELEPHONE LINES.

An insulating transformer for use on telephone lines has recently been placed on the market by the General Electric Company. The purpose of this transformer is twofold:

First—To safeguard the users of telephones from the dangers of high voltages due either to induction or accidental contact between telephone and power lines, where these lines are on the same pole, or upon a parallel adjacent line of poles.

Second—To improve the telephone service by removal of the ordinary small ground gap carbon arrester from direct connection with the line, as well as improvement through better insulation by removing the interior wiring, instrument, batteries, etc., from direct connection with the line.

Special attention has been given to the electrical and mechanical design of the transformer; the high-frequency talking currents are transformed with small loss, while at the same time the magnetizing current, which must be supplied by the ringing generator, is very small. Tests show



Telephone Transformers.

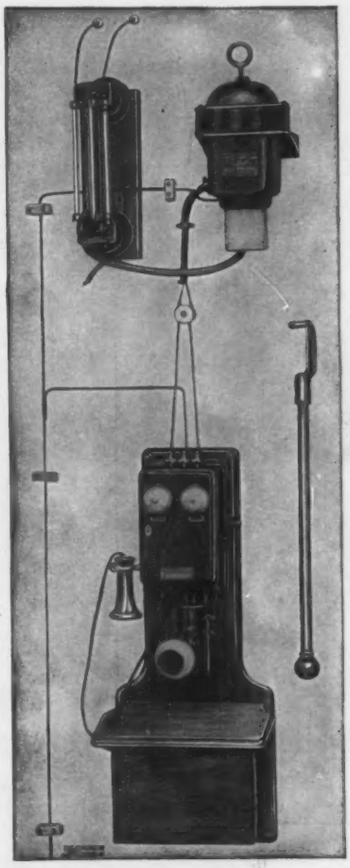
that the magnetizing current taken by this transformer is about half the current passed by a standard 1,000-ohm bell. As can be seen from Fig. 1, the insulating transformer is assembled in a weatherproof iron case and may, if desired, be installed out of doors and mounted in any convenient place.

In designing this transformer the insulation has been considered of primary importance. A high potential test between windings of 25,000 volts for one minute is given to each transformer before shipment. The high insulating quality assured by this test makes the transformer a sturdy piece of apparatus under ordinary conditions of operation, but the best protection is afforded when it is installed with a combined switch, fuse and lightning arrester. This combination affords the greatest safety to both the telephone instruments and the user, even in the most extreme cases when the telephone lines come in actual contact with a high-tension power circuit.

The switch, fuse and lightning arrester combination recommended for this service is shown at the top of Fig. 2, the whole being mounted on a base of insulating material. The long-handled insulated hook at the right of the illustration is used to pull the switch open when it is desired to disconnect the telephone and transformer from the line. The

arrester is hinged at the bottom, the insulated hook engaging with a ring at the top of the arrester. The usual form of carbon arrester with mica separation is used to protect the winding of the transformer against any abnormal difference of potential which might accidentally exist between the telephone lines. This arrester is connected across the terminals of the transformer, but is not connected with the ground.

An adjustable gap arrester is connected between the telephone lines and ground, the function of this arrester being to take care of lightning discharges, and in case of actual contact with high tension lines to arc over and blow the fuse, thus disconnecting the transformer and telephones from the



Telephone with Insulating Transformer and Combination Lightning Arrester and Disconnecting Switch.

line. Should a ground occur on the adjacent high-tension line the voltage induced on the telephone line will not materially interfere with the service, provided the line is sufficiently well insulated. The adjustable air gap is set just beyond the point where this induced voltage will arc across.

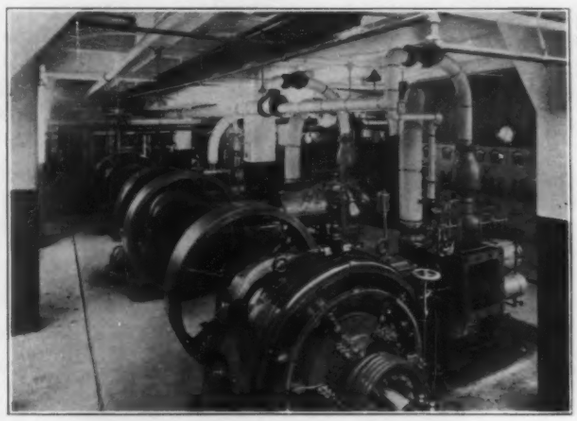
Tests on a 30,000 volt transmission line in actual operation showed that a ground on one phase of the transmission system induced a potential on the telephone line of approximately 7,000 volts, measured between telephone line and earth. Notwithstanding this high induced voltage on the telephone line, it was impossible to use the telephone when the transformer was installed. The line was somewhat noisier than under normal conditions, but not so noisy as to prevent comprehensive conversation.

Bulletin No. 5 from the Kellman Electric & Manufacturing Company, of Los Angeles, shows the Kellman high voltage out-door type oil switches and oil circuit breakers in use.

NEW AGENTS FOR SKINNER ENGINE COMPANY.

The Skinner Engine Company of Erie, Pa., has made arrangements to have their business on the Pacific Coast handled by Henshaw, Bulkeley & Co. of San Francisco, Machinery and Electric Company of Los Angeles and J. M. Main of Portland.

The Skinner Engine Company has been designing and building steam engines for over thirty years. For its product the company claims steam-tight valve economy, practically



Skinner Engines in Alaska Commercial Building.

absolute regulation, automatic oiling and purifying system, accessibility and reliability. They manufacture single valve center crank engines as well as side crank engines of both the single and four-valve type from one hundred to one thousand horsepower. The accompanying view shows an installation of Skinner engines in the Alaska Commercial Building of San Francisco.

DEAN ORDERS.

A showing of eighteen switchboards during one working week of six days is the record made by one of the largest Independent manufacturers. The Dean Electric Company advises that during the week ending March 27th, they shipped the following eighteen boards, which is at the rate of three a day: Twelve private branch exchanges arranging from 50 to 200 lines each for use on the Pacific Coast. One 200-line P. B. X. for the Kansas City Home Telephone Company; a 25-line magneto switchboard for Eureka, Illinois; a 100-line board for Everett, Pennsylvania; a 150-line switchboard for Burlington, Kansas, and a 300-line exchange for Delta, Pennsylvania. The other job was a rush order to replace the Fair Haven (Vermont) exchange, which was destroyed by fire on March 16th. The new equipment was ordered the next day and was shipped from Elyria on the 24th, reached Fair Haven, Vermont, the day it was promised on the 26th, and was in full operation on the 28th. An interruption of only twelve days on a complete replacement of a common battery exchange is a record that all Independents may be proud of. The business done by the Dean Company during this week is only an indication of a widespread business awakening.

"Hot Points" for March, 1909, from the Pacific Electric Heating Company of Ontario, California, tells about the great advertising and educational campaign that is to be conducted by this progressive company during the coming summer. It also shows how the electrical dealer will profit thereby in the sale of electric irons. The text is well worth any man's reading from cover to cover.

THE AMERICAN EVEREADY COMPANY.

An example of the wonderful growth in consumption of dry batteries on the Pacific Coast, is shown by the accompanying illustration of the plant of the American Eveready Company, at 745 to 755 Folsom street, San Francisco. The frame building, shown at the left, was erected within thirty days after the fire of 1906, and served as temporary quarters until the erection of the new Class "B" building in 1908. The old building is still being used for manufacturing purposes and with the new building occupies a space of 40,000 square feet. This has still been found to be inadequate and plans are now being prepared for an additional building, giving a floor space of 20,000 square feet.

The great development of the telephone business and all things electrical, as well as the demand for the automobile trade, is responsible for the fact that the American Eveready Company are now producing daily over a carload of dry batteries in their San Francisco factory.

naturally being shorter in comparison and practically impossible to ship from the Eastern markets on account of the liability of deterioration before reaching the consumer's hands.

When the American Electrical Novelty & Manufacturing Company was first organized, the name was typical, as the principal lines manufactured were electrical novelties, but in later years a great many new and entirely different lines have been added, such as vacuum bottles, speedometers, vulcanizers, automobile starters, volt meters and ammeters, bulldog battery connectors, miniature lamps, etc. For the reason that the old name has ceased to signify any thing, and besides being unsatisfactory on account of its length, it has been decided to change the name of the companies operating in the U. S. A. to American Eveready Company, in England to British Eveready Company, and in Germany to the German Eveready Company. The San Francisco branch being styled the American Eveready Company of the Pacific Coast.

The numerous Eveready Companies have also developed and have now ready for the market something entirely new in the way of a small battery for flash-light use. It is made from entirely different materials and in a different way from the old style cell, and is guaranteed to give more than double the life. It is now possible to produce a pocket flash-

San Francisco Factory of the American "Eveready" Company

In addition to the "Eveready" battery this company has developed a new battery which will be of great interest to all of the telephone companies and electrical trade. This cell, the "Three Crescent" telephone battery, manufactured only at the San Francisco factory, is sold with a guarantee of an initial voltage of 1 6-10, initial amperage from 15 to 18 and a shelf depreciation of only 3 amperes in six months. It has now been on the market a trifle over one year, long enough for a thorough test to have been made in actual use, and the high testimonials of half the telephone companies of the Pacific Coast is a sufficient guarantee that the battery is all that is claimed for it.

In addition to the standard types of dry batteries a complete line of novelty and flash-light batteries is made in San Francisco, and the advantage of coast-made batteries is of even greater importance on the small cells than on the larger sizes, the life of flash-light batteries light, as small as ½x1½x2 inches, which used in conjunction with the new Tungsten lamp will give wonderful results in the way of life and recuperation.

Gas engines in Japan represent nearly 15 per cent of the total motors adopted by manufacturers. The number of factories worked by motors in Japan in 1897 was 2,910, none of them using gas or oil engines; the number of factories using motors in 1906 was 4,656, of which 306 were gas and 429 petroleum engines. Consul J. H. Snodgrass of Kobe states sales in these lines, the imports of American gas, petroleum, and hot-air engines amounting to $14,025, while the imports of American steam engines and boilers amounted to $186,119. This is due to the strong competition of Japanese manufacturers, and also on account of the fealty displayed by the average Japanese dealer in behalf of Japanese products. One of the Kobe iron works is manufacturing a horizontal engine of the latest pattern which can be converted into a gas engine. The manufacturers claim that it can be worked with a very small supply of kerosene, and that it is safe, economical, and simply built.

NEWS NOTES

TELEPHONE.

GRAND FORKS, B. C.—The British Columbia Telephone Company will erect a two-story brick building.

SUSANVILLE, CAL.—N. S. McKinsey has been awarded a contract for constructing telephone lines in Lassen county.

MOUNT VERNON, WASH.—The Sunset Telephone Company will install its system in a new building being erected here.

PORT ANGELES, WASH.—C. J. Farmer has been granted franchises at Bremerton, Charleston, Port Orchard and other nearby towns.

MEDFORD, ORE.—The Citizens' Telephone Company has been incorporated here with a capital stock of $30,000, by E. B. Pickel, et al.

PETALUMA, CAL.—W. D. Thomas has been awarded the contract for constructing a private telephone line to the Guglielmetti ranch in Chileno Valley.

PRESCOTT, WASH.—The Colville Spring Rural Telephone Company will be granted a franchise to enter the city and establish an office.

DILLON, MONT.—The Rocky Mountain Bell Telephone Company will spend a large amount of money in improving its lines in and about the city.

TURLOCK, CAL.—J. T. Randolph has been granted a fifty-year franchise to construct telephone and telegraph lines on public highways in this city.

NEWPORT, WASH.—Manager Anderson of the Newport Telephone Company has started construction of the line down the Pend d'Oreille river valley.

EUREKA, CAL.—Superintendent Mortsolf, of the Hoopa Indian Reservation, is now at work completing plans for a telephone line to the Reservation. He plans to have it in operation before summer.

BUTTE, MONT.—The Montana Independent Telephone Company of Butte and the Interstate Telephone Company of Spokane have entered into an agreement whereby a line will be constructed from Mullan, Idaho, to Missoula, Mont.

LOS ANGELES, CAL.—William Dubilier, chief electrician of the Collins Wireless Telephone Company, of Newark, N. J., is now in this city seeking a suitable site to establish a station. A subsidiary concern is to be formed and instruments manufactured.

RIVERSIDE, CAL.—The Corona Union Telephone & Telegraph Company has been incorporated here with a capital stock of $25,000 by J. G. Jameson, E. J. Genereaux, C. M. Scottville, G. E. Snidecor, W. L. Prizer, W. L. Peelerf and D. Lord.

FINANCIAL.

BAKERSFIELD, CAL.—The McKittrick Oil Company has levied an assessment of 1 cent per share on the capital stock of the company.

HANFORD, CAL.—The Lillian Oil & Mining Company has levied an assessment of 6 cents per share on the capital stock of the company.

SAN LUIS OBISPO, CAL.—The See Canyon Oil Company has levied an assessment of 1 cent per share on the capital stock of the company.

SAN FRANCISCO, CAL.—The Clark Construction Company has levied an assessment of 10 cents per share on the capital stock of the company.

OAKLAND, CAL.—The Oakland Oil & Asphaltum Company has levied an assessment of ½ cent per share on the capital stock of the company.

SAN LUIS OBISPO, CAL.—The San Luis Obispo Mutual Oil Company has levied an assessment of 1 cent per share on the capital stock of the company.

SIERRA MADRE, CAL.—Bonds to the amount of $30,000 have been issued by the city council for purchasing property and erecting a gas plant in this city.

SAN FRANCISCO, CAL.—The $16,000,000 bond issue of the Pacific Telephone & Telegraph Company has been offered for sale by J. P. Morgan & Co., New York.

NEWMAN, CAL.—A bond election will be held in this city on May 4, 1909, to decide on the question of issuing bonds, amounting to $20,000, for obtaining a municipal water supply.

SAN LUIS OBISPO, CAL.—At a bond election held in this city this week it was decided to issue bonds to the amount of $180,000 for municipal improvements. Improvements to the water works will be made, amounting to $80,000.

SAN FRANCISCO, CAL.—The daily earnings of the United Railroads are now $19,250, thus making the quarterly earnings approximately $1,732,500. The company's finances are stated to be in better shape than they have been in years.

SAN DIEGO, CAL.—Secretary M. B. Fowler of the San Diego Gas & Electric Company, announces that the company will pay, on April 18, 1909, the principal of its outstanding first mortgage bonds, with interest accrued to that date, at the Wells Fargo-Nevada National Bank, San Francisco, or at the office of the Standard Trust Company of New York.

INCORPORATIONS.

RIVERSIDE, CAL.—The Hannon Water Company has been incorporated here with a capital stock of $5600 by the Hannon family.

LOS ANGELES, CAL.—The Price Well Oil Company has been incorporated here with a capital stock of $50,000 by A. D. Elwell, C. E. Price and F. E. McLeod.

LOS ANGELES, CAL.—The New Castiac Oil Company has been incorporated here with a capital stock of $500,000 by G. W. McBride, W. Sullivan and C. H. Slease.

SAN FRANCISCO, CAL.—The San Miguel Oil Company has been incorporated here with a capital stock of $250,000 by H. A. and A. H. King and M. K. McKevitt.

BAKERSFIELD, CAL.—The Price-Well Oil Company has been incorporated here with a capital stock of $50,000 by A. D. Elwell, C. E. Price and F. E. McLeod.

BAKERSFIELD, CAL.—The T. W. Oil Company has been incorporated here with a capital stock of $100,000 by T. M. Young, T. W. Thomas, H. E. Griffith and E. M. Bray.

FRESNO, CAL.—The Arizona Petroleum Company has been incorporated here with a capital stock of $250,000 by A. A. Adams, W. M. Claypool, A. J. Picknoll and others.

PLACERVILLE, CAL.—The Heddens Mining & Electric Company has been incorporated here with a capital stock of $1,000,000 by Ralph D. Heddens and Daniel R. R. Caldwell.

LOS ANGELES, CAL.—The Pico Oil Company has been incorporated here with a capital stock of $250,000 by C. Astley, L. W. Andrews, J. W. Reeves, J. Ottofy and F. H. Richards.

OAKLAND, CAL.—The Broadway Oil Company has been incorporated here with a capital stock of $250,000 by W. E. Knowles, E. A. Herron, J. P. Taylor, D. C. and H. L. Breed.

RIVERSIDE, CAL.—The Vista Grande Water Company has been incorporated here with a capital stock of $14,000 by A. D. Bell and others.

SAN FRANCISCO, CAL.—The Exploration Oil Company has been incorporated here with a capital stock of $200,000 by J. H. G. Wolf, Dorsey Ash and M. Meyer.

SAN BERNARDINO, CAL.—The Ontario-Upland Gas Company has been incorporated here with a capital stock of $100,000 by B. E. Page, J. R. Anderson, G. W. Anderson and others.

SAN FRANCISCO, CAL.—The Dunfee Electric Company has been incorporated here with a capital stock of $10,000 by C. H. Dunfee, F. Finck, A. J. Shaw, W. W. Shaw and Alice M. Dunfee.

LOS ANGELES, CAL.—The Big Seven Oil Company has been incorporated here with a capital stock of $10,000 by M. L. Morehouse, M. T. F. Johnson, P. V. K. Johnson and H. P. O'Connor.

SALINAS, CAL.—The Alverez Oil Company has been incorporated here with a capital stock of $500,000 by W. H. Stenger, J. L. Chaddock, W. S. Hoyt, S. W. Smith and E. A. Nickerson.

BAKERSFIELD, CAL.—The Eight Oil Company has been incorporated here with a capital stock of $50,000 by E. W. Owen, S. P. Wible, T. E. Klipstein, H. I. Tupman and F. Haberkern.

HOLLISTER, CAL.—The Alverez Oil Company has been incorporated here with a capital stock of $500,000 by W. H. Stenger, J. L. Chaddox, W. S. Hoyt, S. W. Smith and E. A. Neckerson.

LOS ANGELES, CAL.—The Pierpont Oil Company has been incorporated here with a capital stock of $50,000 by William Hardee, G. E. Whitaker, A. B. Canfield, C. B. Barnes and F. W. Black.

SAN FRANCISCO, CAL.—The Uncas Oil Company has been incorporated here with a capital stock of $500,000, by Burke Corbet, Irving Peterson, J. R. Selby, J. M. Wilson and E. V. Whitaker.

LOS ANGELES, CAL.—The Harrison Avenue Water Company has been incorporated here with a capital stock of $33,000 by Earnest Brooks, H. T. Brooks, F. E. Graham, J. B. and Sarah Tuttle.

BAKERSFIELD, CAL.—The Provident-Midway Oil Company has been incorporated here with a capital stock of $250,000 by T. O. Turner, W. L. Wells, L. B. Howe, C. R. Foster and E. D. Foster.

SAN BERNARDINO, CAL.—The Union Gas Company has been incorporated here with a capital stock of $1,000,000 by C. S. Chestnut, D. W. Campbell W. N. Campbell, P. H. Moore and E. M. Massey.

SAN FRANCISCO, CAL.—The Poso Petroleum Company has been incorporated here with a capital stock of $50,000, by George Quarre, H. D. Seine, O. C. Pratt Jr., C. L. Firebaugh and P. E. Mertz.

BAKERSFIELD, CAL.—The Coast Lines Oil Company has been incorporated here with a capital stock of $320,000 by A. E. Wallace, G. J. Wells, C. K. McKenzie, Frank Hansen and G. M. Emerson.

LOS ANGELES, CAL.—The Billiken Oil Company has been incorporated here with a capital stock of $1,000,000 by W. F. Botsford, A. H. Kemper, A. M. Bernum, H. C. Oakley, W. I. Hollingsworth and W. J. Arkell.

BAKERSFIELD, CAL.—The Templor-McKittrick Oil Company has been incorporated here with a capital stock of $3,000,000 by J. H. Hollywood, F. A. Anderson, W. N. Howes, N. F. Wilson, and J. H. Jordan.

TRANSMISSION.

QUINCY, CAL.—The Round Valley Water Company has been granted a franchise to construct electric power lines along the highways of Indian Township.

SAN FRANCISCO, CAL.—Plans are ready for the new electric power plant to be installed in the United States Mint. Director Frank A. Leach is here from Washington, D. C., to superintend the work.

FRESNO, CAL.—The San Joaquin Light & Power Company is to make important extensions of its lines in the near future. A line is to be built shortly out of the Fresno copper mines into the town of Sanger, a distance of 19 miles.

REDDING, CAL.—The electric power plant connected with the Bonanza King mine, in Trinity county, was completely destroyed by fire last week. The plant was uninsured and the loss is stated to be $65,000. The capacity of the plant was 6000 horse power.

RED BLUFF, CAL.—The following water-rights have been claimed on Mill and Deer creeks: C. E. Burris, appropriating 10,000 inches; A. T. Forward, 10,000 inches; J. J. Worthington, 20,000 inches; Leon Blye, 8000 inches; Philip C. Boardman and Charles J. Newman, each 18,000 inches. While nearly all the choice locations are secured there still remains many desirable sites.

SACRAMENTO, CAL.—The Great Western Power Company has announced that it will soon begin to extend distributing lines from the main tower line at New Hope to supply power and light to the farms on the reclaimed lands. The Great Western Power Company of California has organized a subsidiary corporation known as the California Electric Generating Company, to aid in financing the electric steam generating plant now under construction at Oakland. The Great Western guarantees dividends on $2,500,000 of six per cent preferred stock, of which $600,000 has been issued. Common stock to the amount of $5,000,000 has been issued. Bonds of $5,000,000 are secured by a first mortgage on the plant and, further, by $750,000 of the Great Western Power Company's first mortgage bonds. Part of the bonds have already been sold.

TRANSPORTATION.

EL PASO, TEXAS.—Work has commenced on the El Paso-Fort Hancock Interurban electric line.

FRESNO, CAL.—The Fresno Traction Company has been granted a franchise to construct electric lines on certain thoroughfares in this city.

LOS ANGELES, CAL.—W. H. Workman has been granted a franchise to construct an electric street railway along certain rights of way in this city.

OAKLAND, CAL.—The Oakland Traction Company has been granted a franchise to construct a double or single track extension of its Thirteenth avenue line to Sausal Creek.

SANTA BARBARA, CAL.—The Pacific Improvement Company has applied for a franchise to build a trackless trolley power line from the Potter Hotel to the Hope ranch, a distance of five miles.

STOCKTON, CAL.—Vice President Morris B. Brackett of the San Joaquin Valley Electric Railway Company, left this week for the New York City to sign bonds whereby the company will secure $500,000 for the construction of the new interurban road to Modesto.

MODESTO, CAL.—The directors chosen for the Modesto Interurban Railroad are as follows: T. N. Beard, G. P. Schafer, H. T. Crow, W. H. Frazine, George Parley, D. E. Saunders and L. L. Dennett. The road is to be 53 miles in length and the first extension from Modesto will be to Waterford and Oakdale, via Empire.